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(54) **IMPLANT AND COATING TO REDUCE OSTEOLYSIS**

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(57) **ABSTRACT**

An implant is provided comprising a substrate having one or more nanoceria coatings coated at least partially thereon, wherein the one or more nanoceria coatings comprise surface cerium having a 3+/4+ oxidation state ratio such that the one or more nanoceria coatings exhibit catalase mimetic activity, superoxide dismutase mimetic activity, or both. Methods are provided for forming a nanoceria coating. The coating has nanoceria having a surface cerium 3+/4+ oxidation state ratio such that such that the coating exhibits catalase mimetic activity, superoxide dismutase mimetic activity, or both. Also disclosed is a method of reducing degradation of an implant by placing nanoceria in proximity to a bone-implant interface.